only down to the lowest r associated with the remaining C_d.

(8) If the standard deviation of the remaining C_d still exceeds 0.3% of the mean of the remaining C_d values, repeat the steps in paragraph (e)(4) through (8) of this section.

§ 1065.642 SSV, CFV, and PDP molar flow rate calculations.

This section describes the equations for calculating molar flow rates from various flow meters. After you calibrate a flow meter according to § 1065.640, use the calculations described in this section to calculate flow during an emission test.

(a) *PDP molar flow rate*. Based upon the speed at which you operate the PDP for a test interval, select the corresponding slope, a_1, and intercept, a_0, as calculated in § 1065.640, to calculate molar flow rate, $\dot{n}$, as follows:

$$\dot{n} = f_{nPDP} \cdot \frac{p_{in} \cdot V_{rev}}{R \cdot T_{in}} \qquad \text{Eq. 1065.642-1}$$

Where:

$$V_{rev} = \frac{a_1}{f_{nPDP}} \cdot \sqrt{\frac{p_{out} - p_{in}}{p_{in}}} + a_0 \qquad \text{Eq. 1065.642-2}$$

Example:

a_1 = 50.43
f_{nPDP} = 755.0 rev/min = 12.58 rev/s
p_{out} = 99950 Pa
p_{in} = 98575 Pa
a_0 = 0.056
R = 8.314472 J/(mol·K)
T_{in} = 323.5 K
C_p = 1000 (J/m³)/kPa
C_t = 60 s/min

$$V_{rev} = \frac{50.43}{755} \cdot \sqrt{\frac{99950 - 98575}{98575}} + 0.056$$

V_{rev} = 0.06389 m³/rev

$$\dot{n} = 12.58 \cdot \frac{98575 \cdot 0.06389}{8.314472 \cdot 323.5}$$

$\dot{n}$ = 29.464 mol/s

(b) *SSV molar flow rate*. Based on the C_d versus $Re^{\#}$ equation you determined according to § 1065.640, calculate SSV molar flow rate, $\dot{n}$ during an emission test as follows:

$$\dot{n} = C_d \cdot C_f \cdot \frac{A_t \cdot p_{in}}{\sqrt{Z \cdot M_{mix} \cdot R \cdot T_{in}}} \qquad \text{Eq. 1065.642-3}$$

Example:

A_t = 0.01824 m²
p_{in} = 99132 Pa
Z = 1
M_{mix} = 28.7805 g/mol = 0.0287805 kg/mol
R = 8.314472 J/(mol·K)
T_{in} = 298.15 K
$Re^{\#}$ = $7.232 \cdot 10^5$
γ = 1.399
β = 0.8
Δp = 2.312 kPa
Using Eq. 1065.640–6,
r_{ssv} = 0.997
Using Eq. 1065.640–5,
C_f = 0.274
Using Eq. 1065.640–4,
C_d = 0.990

$$\dot{n} = 0.990 \cdot 0.274 \cdot \frac{0.01824 \cdot 99132}{\sqrt{1 \cdot 0.0287805 \cdot 8.314472 \cdot 298.15}}$$

$\dot{n}$= 58.173 mol/s

(c) *CFV molar flow rate.* Some CFV flow meters consist of a single venturi and some consist of multiple venturis, where different combinations of venturis are used to meter different flow rates. If you use multiple venturis and you calibrated each venturi independently to determine a separate discharge coefficient, C_d, for each venturi, calculate the individual molar flow rates through each venturi and sum all their flow rates to determine $\dot{n}$. If you use multiple venturis and you calibrated each combination of venturis, calculate $\dot{n}$ using the sum of the active venturi throat areas as A_t, the sum of the active venturi throat diameters as d_t, and the ratio of venturi throat to inlet diameters as the ratio of the sum of the active venturi throat diameters to the diameter of the common entrance to all of the venturis. To calculate the molar flow rate through one venturi or one combination of venturis, use its respective mean C_d and other constants you determined according to §1065.640 and calculate its molar flow rate $\dot{n}$ during an emission test, as follows:

$$\dot{n} = C_d \cdot C_f \cdot \frac{A_t \cdot p_{in}}{\sqrt{Z \cdot M_{mix} \cdot R \cdot T_{in}}} \qquad \text{Eq. 1065.642-6}$$

Example:

C_d = 0.985
C_f = 0.7219
A_t = 0.00456 m²
p_{in} = 98836 Pa
Z = 1
M_{mix} = 28.7805 g/mol = 0.0287805 kg/mol
R = 8.314472 J/(mol·K)
T_{in} = 378.15 K
$\dot{n}$ = 0.985·0.712

$$\frac{0.00456 \cdot 98836}{\sqrt{1 \cdot 0.0287805 \cdot 8.314472 \cdot 378.15}}$$

$\dot{n}$ = 33.690 mol/s

EFFECTIVE DATE NOTE: At 73 FR 37327, June 30, 2008, §1065.642 was amended by revising paragraph (b), effective July 7, 2008. For the convenience of the user, the revised text is set forth as follows:

§ 1065.642 SSV, CFV, and PDP molar flow rate calculations.

* * * * *

(b) *SSV molar flow rate.* Based on the C_d versus Re# equation you determined according to §1065.640, calculate SSV molar flow rate, $\dot{n}$ during an emission test as follows:

$$\dot{n} = C_d \cdot C_f \cdot \frac{A_t \cdot p_{in}}{\sqrt{Z \cdot M_{mix} \cdot R \cdot T_{in}}} \qquad \text{Eq. 1065.642-3}$$

Example:

A_t = 0.01824 m²
p_{in} = 99132 Pa
Z = 1
M_{mix} = 28.7805 g/mol = 0.0287805 kg/mol
R = 8.314472 J/(mol·K)
T_{in} = 298.15 K
$Re^{\#}$ = 7.232·10
y = 1.399
β = 0.8
Δp = 2.312 kPa
Using Eq. 1065.640–7,
r_{ssv} = 0.997
Using Eq. 1065.640–6,
C_f = 0.274
Using Eq. 1065.640–5,
C_d = 0.990

$$\dot{n} = 0.990 \cdot 0.274 \cdot \frac{0.01824 \cdot 99132}{\sqrt{1 \cdot 0.0287805 \cdot 8.314472 \cdot 298.15}}$$